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Review article

DIGITAL TOOLS IN MUSEUM LEARNING – A LITERATURE REVIEW FROM 2000 TO 2020

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Abstract. *This paper discusses the relationship between new technologies and learning in museums, as a significant issue that is increasingly occupying the attention of many researchers, especially in developed countries. The connection between digital technologies and modernization of the learning process in museums is pointed out, which is more and more present, and is becoming an integral part of formal education. Museums, as institutions for the preservation of tradition and culture, are increasingly using digital media in their practice, as intermediaries in the development of a system of culture and tradition knowledge among the younger generations. The aim of this paper is to provide a chronological overview of new technologies used for learning in museums, based on the review and analysis of selected literature. For the purposes of this paper, all research studies are classified into four time frames in which the application of digital technologies in learning in museums can be monitored, from the first used tools to the appearance of virtual museums. The results of the research show that there is a connection between the development of new digital technologies and learning in museums, ie that the learning process in museums is modernized and changed in accordance with the development of modern digital tools. The paper concludes that today, learning in museums goes beyond existing traditional models, based on visits, lending of exhibits and lessons in museums and is increasingly becoming a modern learning process based on digital technologies.*

Key words: *digital technologies, museums, learning, digital tools, modernization*

1. INTRODUCTION

During the past several decades there have been significant changes in the field of education and upbringing, especially in the field of learning culture. Unlike previous periods when the dominant paradigm was reflected in a mechanistic approach to learning,

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new approaches such as constructivism point to the need of establishing a system of knowledge that would primarily be flexible and founded on principles of transparency, and harmonized with goals and needs of modern education. In that respect, a significant place in the process of learning is taken by formal and informal contexts, as well as modern digital technologies which open new perspectives in the field of education. A large number of authors indicate that using digital technologies improves the quality of learning by bringing forth new characteristics, that learning motivation is significantly increased, as well as that learning efficiency is at a higher level (Cahill et al., 2011; Bayne, Ross, & Williamson, 2009; Hsi, 2008). Accordingly, digital technologies increasingly become an integral part of the learning process in schools as well as in other institutions and informal learning contexts. Consequently, learning in museums by resorting to modern digital technologies becomes an inevitable component part of formal education in all developed countries.

It has long been known that museum learning is of great importance, as well as that museums increasingly recognise teachers and students (both in primary and secondary schools) as their prevalent audience. With modern digital resources, museum learning surpasses traditional models (visits, borrowing of exhibits, lessons in museums, and narratives at exhibitions) and it becomes transformed into a modern learning process based on digital technologies which find their unique expression in the development of virtual museums.

In that context, the subject of this theoretical research is the relationship between new technologies and museum learning based on reviews and analyses of relevant research papers. The aim of this research is to offer a chronological overview of new technologies used for the purpose of museum learning. According to the set goals a general hypothesis has been defined which assumes that museum learning is going through changes when it comes to using digital tools, depending on the development of new technologies.

In order to test the hypotheses, the paper offers an overview of relevant papers dealing with the application of different digital tools in museum learning which led us to the final considerations.

2. MUSEUM LEARNING

In pedagogical theory and practice, museum learning is an issue that arouses the interest of numerous authors who have been dealing with various aspects of museum learning and its organization for many years (Andre, Durksen, & Volman, 2017; Milutinović, Gajić, & Klemenović, 2008; Hein, 1998). When observed through a historical prism, one can assert that museum learning has a series of specificities among which one can single out the possibility of introducing children to real-life objects, thus offering them an opportunity to experience a contextual learning process, through direct contact with objects of knowledge (Milutinović, 2019). In that respect, the practice of museum learning finds its theoretical basis in the constructivist theory, which emphasizes an active positioning of students in the process of learning, and the creation, i.e. construction of a system of knowledge according to a child´s previous experiences and social context. Accordingly, the author Milutinović emphasizes that "a student´s personal activity is of key importance for the process of learning" (Milutinović, 2019, p. 55). Museums are informal learning environments which makes the process of learning quite different than that in formal institutions such as schools. It is believed that

museum learning is self-directed, voluntary, and personal, i.e. it does not depend on external authorities such as teachers. Such an approach provides children with an opportunity to learn in museums according to their own learning styles and to make progress according to their own pace and interests. An important characteristic of museum learning is focusing on the process of learning, rather than on learning outcomes. According to J. Milutinović "key elements of museum learning comprise the creation of a link between the known and the unknown, acquiring an authentic experience by observing and manipulating real objects or experiencing real phenomena" (Milutinović, 2010, p. 220).

During the past two decades museum learning has significantly changed by introducing new technologies, primarily digital ones, which created optimal conditions for modernizing the process of learning in these institutions (Parry, 2007; Morita, 2002). The use of digital technologies in museums has developed in several directions, starting from cataloging and easier search of content, over wireless devices and recorded explanations, all the way to virtual museums and virtual reality which enables virtual representations of exhibits as an addition to the physical museum context. It is believed that museums, lifelong learning, and digital technologies share the same idiosyncrasies because the focus is placed on learning by using objects instead of learning about objects, as well as on strategies for researching and discovering information instead of transferring the necessary information and data. Nowadays, the capacities of digital technologies offer various learning possibilities to museum visitors, primarily an interactive approach to obtaining various information in accordance with their interests and knowledge. Hence, in museums, one encounters a model of learning "for creating digital contents", rather than a model of "offering information" (Loran, 2005). In the past several years the application of such an approach is noticeable in the practice of leading world museums, whereby one can observe an incredible increase in the use of digital learning technologies, both on-site, in the form of digital interactives, and online, by creating increasingly popular websites. It is believed that the use of digital tools in museums has significantly affected the growth in the number of visitors because even during 2002 the number of online visitors to a large number of museum websites was larger than the number of visitors on the spot (Hawkey, 2004).

The use of digital tools in museums introduced new challenges for teachers and curators, as well as for programmers when it comes to creating suitable applications which would make museum learning more efficient and active. With the increase of Internet speed and the development of new digital tools, museum learning becomes increasingly popular, while museums intend to expand their work with the audience and achieve new levels of communication. In that context, one can expect changes in and development of virtual learning environment in order to efficiently use museum platforms and include visitors from all over the world (Moore, 2015).

3. Methodological Approach

The subject of this theoretical research is a study of the impact of new technologies on museum learning by performing an overview and analysis of relevant research papers. According to the defined topic, the main research goal is to offer a chronological overview of new technologies used for the purpose of museum learning. Consequently, research tasks related to an overview and analysis of relevant research papers which study the use of new technologies in the process of museum learning. Thus, one can define the

following research hypotheses: **The general hypothesis** assumes that there are changes in museum learning produced by the development of new technologies. **Special hypotheses** are as follows: (1) It is assumed that in relevant research studies one can single out chronological periods characterized by the application of new technologies in museum learning (2) It is assumed that museum learning changes according to the development of digital technologies, from applying initial digital tools to virtual museums.

The first research step was searching and selecting relevant research papers, while some basic selection criteria were as follows (a) that papers provide the description of new technologies in museum learning; (b) that papers provide a definition or a description of museum learning; (c) that papers are oriented towards younger visitors, children, and youth. For the purpose of this paper, the authors searched through Google Scholar by using the phrase *digital learning in museums*. After analyzing the selected papers some chronological regularities were noticed. Hence, all papers were sorted to encompass four periods: the first period between 2000 and 2005, the second period between 2006 and 2010, the third period between 2011 and 2015, and the fourth period between 2016 and 2020. This research resorted to papers published in English, bearing in mind that by searching the same base one could not encounter papers published in Serbian. A literature search for related articles was conducted during November 2020.

4. RESEARCH OVERVIEW – CHRONOLOGICAL APPROACH

4.1. The first period: 2000 – 2005

In this period one can already encounter ideas that speak in favour of various potentials of digital technologies in museum learning (Paris, 2002; Heath & vom Lehn 2002; Hamma, 2004). These are early phases of the development of digital systems for wide use, including museum use. Thus, these papers are mostly focused on their design and potentials, and rarely on attitudes towards their use. In one of the first papers published on this topic in 2001 (Spasojevic & Kindberg, 2001), the authors pointed to various potentials of digital technologies for museum learning. The authors described the use of wirelessly connected handheld devices in the Museum of Science with the aim of inquiring into the use of technologies to connect the physical and virtual world. Namely, the museum exhibits were enriched by web pages that could be accessed through wireless devices provided to visitors at the entrance. The network-based computer infrastructure provided museum visitors with extended museum experience so it was easier to plan a visit, which created an impact of exhibits and other educational materials on learning activities (Spasojevic & Kindberg, 2001).

A significant advantage of new technologies in museum learning is interactivity which is, according to some authors (Heath & vom Lehn, 2002), a component part of a wide specter of digital tools and technologies which can be used in museums. Sophisticated information systems enable complex forms of interactions between users and exhibits which creates a favourable interactive learning environment. This study confirms that in this period one still lacks concrete results which would inquire into the impact of digital technologies on museum learning, but that there is a clear understanding of such an impact, as well as that further research is necessary.

During 2004 there are numerous research papers that deal with various potentials of digital technologies in museum learning. Authors Prosser and Eddisford (2004) researched into attitudes of children and adults towards virtual representations of museum

objects. By resorting to interviews in this qualitative study authors obtained the data stating that by applying information and communication technologies in museums one can achieve interactions that could contribute to added-value learning. Namely, with these technologies, one can expand and improve their museum experience and this added value signifies that digital exhibits are not an end in itself, but a means to dive deeper into the issue, i.e. to extend the understanding of the past by making the users familiar with the use of certain objects. The paper analyses the examples of a virtual theatre orchestra from Burma and a project from the Victorian era. Authors state that well-thought-out learning activities provide a framework for a better understanding because they add a personal dimension by extending the interaction with exhibits as objects of knowledge. Users are given an opportunity to experience the context in which exhibits were initially used as well as the feelings which cannot be easily aroused in a real-life museum (Prosser, Eddisford, 2004, p. 295).

During 2004 one can encounter papers that deal with an enormous increase in the use of digital technologies in museum learning, scientific centres, galleries, etc. This use is reflected in the form of digital interactions, both on the spot and online, by creating increasingly popular websites (Hawkey, 2004). In that context, it is believed that museums have higher potentials to plan to learn through the following:

- The opportunity to organize learning as a constructive dialogue, not as a passive transfer of information,
- Assuming the role of a privileged participant, and not that of an expert,
- Careful assessment of the significance of a formal curriculum (and its evaluation process)
- Facilitating lifelong learning by creating a learning environment dominated by the principle of free choice allows for different approaches (Hawkey, 2004, p. 2).

4.2. The second period: 2006 – 2010

In the second period, there are papers about new computer paradigms which allow the computers to become installed in exhibits and in new environments in different ways. It is recognized that the development of software technologies could create new possibilities to use computers to improve museum learning. Authors Hall and Bannon (Hall & Bannon, 2006) presented the results of a design process which aimed at researching interactive techniques using ubiquitous computer technology to stimulate active participation, inclusion, and learning of children who visited the exhibition "Re-searching the past" at the Hunt Museum, in Limerick, Ireland. The research included 326 students (aged between 9 and 12). Based on the research results authors created guidelines for modernization of museum learning which included 12 criteria: that there is a narrative structure, that the showroom is attractive, that it includes visitors´ contribution, that the experience is integrated through computers, that it maintains curiosity, that it contributes to formal education, that it supports learning through senses, that it facilitates individual and group interaction, that it supports learning by discovery, that it supports different types of visits, that it includes different activities and that it secures regular and timely intervention (Hall & Bannon, 2006, p. 7).

Apart from new computer technologies, this is the period when mobile technologies are increasingly used and developed, and so it is understandable that there are papers that deal with their use in museums. Authors Gammon and Burch (Gammon & Burch, 2008) point out that the key to efficient use of mobile technologies for museum learning is a detailed understanding of the needs, wishes, expectations, and behaviours of visitors

because with all their potentials mobile technologies also introduce a large number of difficulties. The greatest potential of these technologies is supporting different learning styles, providing authentic experiences, providing the possibility of connecting visitors through different forms and formats, which is especially noticeable in digital games which are interactively connected with museum exhibits and other visitors. The possibility of digital recording through mobile devices is especially important for school children because it is established that activities performed in the school environment after the visit to the museum are especially important for sustainable learning (Gammon & Burch, 2008, p. 37). The advantage of mobile technologies is in a personalized interpretation because users adjusted their mobile devices to their needs, unlike museum devices which are the same for all visitors.

In this period, one can notice the use of social media for the purposes of museum learning because social media as we know them today appeared at the beginning of the new millennium. Social media have the potential to encourage participation in the learning sector which was a one-way process in the past, as well as a transition from knowledge transfer to engagement and participation of the audience. Social networking can play a central part in learning in informal environments such as museums, libraries, and galleries. Social media primarily offer a way of communication to young people, as well as a learning space that was not available earlier in informal environments. In the paper titled "The impact of social media on informal learning in museums" (Russo, Watkins, & Groundwater-Smith, 2009) authors consider transformations in digital literacy and processes through which students can connect with knowledge in informal learning environments and become active cultural participants. Social media (for instance, My Space, Facebook), various blogs, podcasts, and wikis impact learning transformation by securing two-way communication and informal content. This is best illustrated by the example of the MoMA museum in New York where visitors can access comments and podcasts created by other visitors through the ArtMobs3 platform, and not merely through official content created by the museum (Russo, Watkins, & Groundwater-Smith, 2009, p. 159).

More recent research studies in this period indicate the possibility of applying navigation algorithms that could provide efficient results in museum learning. In that sense, such systems are described to enable the organization of visits so that every visitor can go through an optimal experience (Chiou et al., 2010). The research was realized in Taiwan in the museum of butterflies and the results indicate that navigation systems have high learning potentials. In this period, more new technologies are mentioned such as RFID (radio frequency identification), the use of which was described by authors Huang, Chang, and Sandnes (2010).

4.3. The third period: 2011 – 2015

The third period is marked by new developments in the field of digital technologies. Even though Web 2.0 was created in October 2004, its wider application in all fields started in 2010 (Hosch, 2017), so it is understandable that the first papers about museum learning by resorting to Web 2.0 appear in this period. Author Bianca Bocatius (Bocatius, 2011) presented in her paper an analysis of the use of Web 2.0 technologies on the examples of the Jewish Museum in Berlin, the Staedel Museum in Frankfurt, as well as the Brooklyn Museum. Based on the comparison of online services offered in these museums it is concluded that Web 2.0 offers a series of advantages for online learning: it ensures public access to cultural heritage, it allows the visitors to prepare and individually

review their visits, it offers the possibility to participate, communicate and have an active dialogue, it connects and shares the education online and on the spot and it guarantees a communicative and participative relationship between museums and their visitors on the spot and online. The author concludes that Web 2.0 is a cultural and social phenomenon, and not merely a matter of technical development and that museums are increasingly aware of it (Bocatius, 2011).

In this period one is a witness to a growing interest in applying computer games in museums due to an increase in their potentials for learning and education. A paper by Greek authors (Yiannoutsou & Avouris, 2012) researches aspects of museum learning through mobile games, i.e. the games usually played by groups of players by using mobile devices which enable interaction with space and exhibits as well as physical mobility of players. The most frequent model followed by these games is "Treasure hunt", whereby visitors who reach certain exhibits need to provide a correct answer or solve a task to receive guidelines to continue with the game. It is believed that they result in engaging visitors, boosting motivation, and learning about museum exhibitions (Yiannoutsou & Avouris, 2012). The other type of popular games includes narratives and role-playing. Such is, for instance, "Mysteries at the Museum" whereby visitors are guided through a certain story by role-playing thus having an opportunity to deal with details regarding some exhibits and gain a wider knowledge about more exhibits (by combining the depth and width). Authors analysed this game at the Boston Museum of Science and they pointed to various positive learning effects in cases when the plot of the story mentioned in the game is well devised and substantial (Yiannoutsou & Avouris, 2012, p. 80).

Since 2010 the Smithsonian Museum through its Center for Learning and Digital Approach conducted a series of research projects in order to grasp how teachers and their students use museum resources to learn. Authors Milligan and Wadman (2015) analysed the results of five independent studies and offered recommendations for the best practical use of a digital approach in museum learning. Based on teachers´ requirements it is concluded that the most desirable contents on digital platforms for museum learning are either interdisciplinary or multidisciplinary ones, as well as those contents which can be integrated with students´ interests and with established teaching standards and those which can be adjusted to different styles (such as different presentation formats, sharing and exchange). Furthermore, teachers prefer platforms that unite the content from different sources (for instance, not merely in one museum) and which possess better tools for search and presentation (Milligan & Wadman, 2015).

Similarly, in a study conducted at the Museum of Art in Northern Carolina authors established the value of modern pedagogical models which implement new technologies in museum learning. Namely, it is about a programme that is a part of a distance learning initiative that uses the flipped classroom model to acquire knowledge related to museum contents. Based on qualitative and quantitative data provided by secondary school students the paper concludes that the teaching process designed in this way increases learning outcomes, creates emotional bonds, and encourages positive museum experiences for students. Within this study, apart from described experiences, there are also recommendations for the design of future flipped museum programmes (Harrell & Kotecki, 2015).

4.4. The fourth period: 2016 – 2020

During this period, one can observe a conspicuous growth in research studies dealing with learning through digital technologies in museums. Such is, for instance, a study conducted in Saudi Arabia, which investigated the attitudes of primary school students regarding the use of interactive virtual museums for the purpose of developing the knowledge of cultural heritage (Ismaeel & Al-Abdullatif, 2016). The research provided information that the insight into the design and use of virtual museum interactive learning applications raises students´ awareness of the national cultural heritage. Study results are precious for future designs of education policies as well as for curriculum makers as an important component that forms the identity of the young through the process of education in academic institutions. The findings of this study point out the significance of education value provided by virtual museums. They indicate that such museums strengthen the process of education as a new source that complements the curriculum, works on expanding resources of traditional educational institutions, and offers students the knowledge of culture in the context of different activities. It is concluded that virtual museums can take an important place in the future of education, especially when it comes to content that relates to culture and tradition (Ismaeel & Al-Abdullatif, 2016, p. 38).

In this last period, one also encounters the first papers resorting to meta-analysis to show the systematization and a cross-section of previous knowledge from studies that relate to digital museum learning. One of those is the paper titled *Museums as avenues of learning for children: a decade of research* by authors Andre, Durksen, and Volman from 2017. In the section dealing with digital technologies at the museum, it was noted that interactivity is increasingly observed as a key element in children´s experiences in the museum context. The authors established that dominant activities were interactive exhibitions with the help of technology and practical activities led by free or limited choices, whereby the impact of technologies was of key importance for children's interaction with museum exhibits. The focus was placed on the application of the system of mobile guidance and interactive games (Andre, Durksen, & Volman, 2017).

In this period, virtual museums become especially popular, primarily because of a wider use conditioned by the increasing availability of this technology. Apart from availability, the power of computers enabled the use of virtual characters – avatars for a deeper experience of a virtual visit to the museum (Carrozzino et al. 2018). Bearing in mind a tremendous learning potential, working with these technologies is complex and it requires the inclusion of a large number of experts: curators, creative individuals, programmers, as well as pedagogues who have to work together to evolve towards a more efficient connection between visitors, collections and digital applications, and for the purpose of more efficient learning (Pietroni, 2019). That virtual museums can significantly contribute to the development of the learning process in museums was also confirmed by the paper of author Linda Daniela (2020) who analysed virtual museum visits, assessing them from the perspective of learning. To that purpose, the author analysed 36 virtual museum applications in total and it was confirmed that in the previous practice the main focus when creating virtual museums was placed on information architecture, while less attention was dedicated to the educational value of the material. In her conclusion, the author points out the need to change the existing principles of designing virtual museums towards an increasing engagement of the educational dimension by consulting teachers and pedagogues (Daniela, 2020, p. 17).

In this period there are papers that write about the potentials of augmented reality systems – AR. In museum learning, the existing systems have three main parts – public regime (for adults), children´s regime (for primary and secondary students), and environmental management platform (for employees at the museum) and they function on the principles of problem-based learning (Lin et al., 2019). The museum staff can use the platform to manage the environment to easily change the content presented in the application, and users can resort to their smartphones to establish a direct connection and experience museum learning. Regimes for adults and children designed for this system generated different learning experiences according to students´ individual needs. They motivate students, activate interests by using interesting problems and advice or attitudes of other users with the aim of integration into the museum educational environment. This system aims to offer users a large number and width of perspectives through the process of learning in the museum environment. In the future, this system can be applied to various fields of informal education, and it will be possible to implement it in teaching methods at schools through museum visits and theme exhibitions (Lin et al., 2019, p. 546).

A special technological novelty that begins to be recognized in this period when it comes to museum learning digital technologies is virtual reality – VR to show museum exhibits. The difference between virtual and augmented reality is in the fact that VR creates a completely new and separate experience, while AR represents a virtual addition to physical reality. In the VR experience, one explores a completely new world, while in the AR experience one explores the existing, though improved, reality. One needs to single out the combination of computer games and virtual reality environment which can improve learning and training methodology, which is considered to have a promising future strengthened by the wide availability of software and hardware tools for VR environment on the market. Instead of being passive observers the users in those environments are included as active participants allowing for the development of learning paradigms based on research (Checa & Bustillo, 2020). Ćosović and Brkić suggest the application of 3D technologies for a wider approach to exhibition collections with the aim of a more attractive and interesting presentation of the cultural heritage (Ćosović & Brkić, 2020). Namely, they suggest game-based learning as a manner of active learning at the museum. It is believed that presenting cultural heritage increasingly contributes to raising awareness and motivating museum users to learn and educate themselves. According to these authors´ assertions material cultural heritage can be present in virtual worlds, and so 3D technologies are becoming increasingly popular and significant in game-based museum learning. In the paper, the authors pointed out some advantages and disadvantages when using new technologies, as well as their importance for the process of learning in a museum environment (Ćosović & Brkić, 2020).

5. CONCLUSION

The application of new technologies in museum learning during the past decade is a subject of interest of a larger number of theoreticians of different professions and profiles. It is noticeable that with the development of a larger number of digital tools they become increasingly present in museum learning so that one can assert that there is a connection between the development of digital technologies and their application in museum learning, i.e. that periods in the development of digital technologies are synchronized

with the application of different technological devices for museum learning. By gaining insight into relevant research papers one could reach the conclusion that museum learning follows the development of new technologies, at least in developed countries. In that context, it is a logical sequence of events that there are changes in museum learning caused by the development of modern technologies, which confirms the general research hypothesis.

Based on the overview and analysis of research papers one can assert that there are four periods that chronologically follow the development of new technologies and changes in museum learning, which confirms the first special hypothesis. Namely, for the purpose of this paper, we defined four periods in which one can notice changes in museum learning through the use of digital technologies (the first period 2000/2005; the second period 2006/2010; the third period 2011/2015; and the fourth period 2016/2020).

The analysis of research papers confirms the second hypothesis stating that the process of learning in museums changes according to the application of new technologies which increasingly become an integral part of museum learning. Namely, based on the chronological representation one can conclude that in the beginning, from 2000 to 2005, museums mostly resorted to digital and audio recorders and websites; the second period is characterized by the introduction of RFID technology, improvement of previous tools, the introduction of social media to exchange educational information in museums and first mobile experiences; in the third period one encounters Web 2.0, computer games and the development of a wider specter of mobile services for museum learning; while in the fourth period, previous tools become improved and virtual museums become predominant. Furthermore, one can notice that in the beginning digital tools were applied in a modest way and to a much lesser extent. Unlike that, the last period is characterized by their larger presence and availability, especially when it comes to virtual museums.

The knowledge of applying digital technologies in museum learning, especially their chronology, as well as the potential of virtual museums, constitute the contribution of this paper which can be used primarily by teachers in primary and secondary education for the purpose of modernizing their teaching process, as well as to motivate students to learn about historical and cultural values and development of positive attitudes towards the preservation of tradition and culture. The limitations of this paper relate primarily to a relatively modest number of presented research studies that consider the relationship between new technologies and museum learning.

If one bears in mind the mentioned contributions and limitations, this paper can be a good starting point for future research into the impact of digital technologies on changes in museum learning.

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DIGITALNI ALATI U MUZEJSKOM UČENJU – PREGLED LITERATURE OD 2000 DO 2020 GODINE

U radu se razmatra odnos novih tehnologija i učenja u muzejima, kao značajno pitanje koje sve više okupira pažnju mnogih istraživača, posebno u razvijenim zemljama. Ukazuje se na povezanost digitalnih tehnologija i modernizaciju procesa učenja u muzejima, koja je sve prisutnija i danas postaje sastavni deo formalnog obrazovanja. Muzeji, kao institucije za očuvanje tradicije i kulture sve više u svojoj praksi koriste digitalne medije, kao posrednike u razvoju sistema znanja o kulturi i tradiciji kod mladih generacija. Cilj ovog rada je da se pruži hronološki pregled novih tehnologija koje se koriste za učenje u muzejima, na osnovu prikaza i analize selektovane literature. Za potrebe ovog rada sve istraživačke studije su razvrstane u četiri vremenska okvira u kojima se može pratiti primena digitalnih tehnologija u učenju u muzejima od prvih korišćenih alata, pa sve do pojave virtuelnih muzeja. Rezultati istraživanja pokazuju da postoji povezanost između razvoja novih digitalnih tehnologija i učenja u muzejima, odnosno da se proces učenja u muzejima modernizuje i menja u skladu sa razvojem savremenih digitalnih alata. U radu se zaključuje da danas, učenje u muzejima prevazilazi postojeće tradicionalne modele, zasnovane na posetama, pozajmljivanju eksponata i lekcijama u muzeijima i sve više postaje moderan proces učenja baziran na digitalnim tehnologijama.

Ključne reči: *digitalne tehnologije, muzeji, učenje, digitalni alati, modernizacija*.